

Monday, August 9, 2004 Technical Session I

The Future—Military Missions Under Development or Proposed that Provide Measurable Utility to the Warfighter

Chair: James Liller, Northrop Grumman/NRO

- 3:00 PM Announcements
- 3:15 PM Engineering a Responsive, Low Cost, Tactical Satellite—TacSat-1
Tim Duffey, Joe Hauser, Michael Hurley, Jeffery Cleveland, Chris Huffine, Ken Weldy—Naval Research Laboratory
- 3:30 PM Space Test Program-1 (STP-1)—First of its Kind
Maj. Raymond L. Galik—Space & Missile Systems Center Det 12 STS
- 3:45 PM Satellite Americano—A Standardized Military Spacecraft
Robert Newberry, Shenen Hoefflerle, Samantha Martinez—Space & Missile Systems Center Det 12
- 4:00 PM Environmental Objectives for the Russian American Observational Satellites (RAMOS) Program
Thomas Humpherys, V. Privalsky—Space Dynamics Laboratory; V. Sinelshchikov, V. Abramov, V. Misnik—TsNPO Kometa; A.T. Stair, I. Schiller—Visidyne Inc.
- 4:15 PM Roadrunner, A High-Performance Responsive Space Mission
Terrance Yee—Microsat Systems
- 4:30 PM The Deployable Structures Experiment: Design of a Low-Cost, Responsive R&D Spacecraft
Jim King, Larry Davis, Shane Kemper, Dan Cohen, Scott Greeley—Planning Systems, Inc.; Aaron L. Adler, Gregory G. Spanjers, James E. Winter—Air Force Research Laboratory

Tuesday, August 10, 2004 Technical Session II

Measuring Small Satellite Utility—Detailed Metrics and Proposed Analytical Methods that may be Applied to Small Satellites to Gauge their Utility in Military, Scientific, Commercial and Other Applications

Chair: Debra Factor Lepore, Kistler Aerospace Corporation

8:30 AM Announcements

8:45 AM Evaluating the Present and Potential Future Impact of Small Satellites

Andy Lewin—Johns Hopkins University/Applied Physics Laboratory

9:00 AM Small Satellite Standards Development

Jeff Ganley—Air Force Research Laboratory VSSV

9:15 AM Metrics to Support the Design of Small-Satellite-Based High-Resolution Mapping Systems

Rainer Sandau—Deutsches Zentrum für Luft-und Raumfahrt

9:30 AM Disruptive Space Technology

Jim Benson—SpaceDev

9:45 AM University-Class Satellites: From Marginal Utility to 'Disruptive' Research Platforms

Michael Swartwout—Washington University in St. Louis

10:00 AM Real-Time Mission Planning for Responsive Spacelift

Brian Horais—Schafer Corporation; Joe Guerci—DARPA/SPO

10:15 AM Bringing Space Capabilities to the Warfighter: Virtual Mission Operations Center (VMOC)

Brett P. Conner, Larry Dikeman, Victor Osweiler—Air Force Space Battlelab; Dale Schoenfelt, Steve Groves—Army Space and Missile Defense Command Battle Lab; Philip Paulsen, Will Ivancic—NASA Glenn Research Center; Jon Walke, Eric Miller—General Dynamics—Advanced Information Systems

10:30 AM Migration of DoD Satellite Operations from the Space Ground Link Subsystem (SGLS) Frequency Band to the Unified S-Band (USB)

Kay Beckstead—Space & Missile Systems Center Det 12; Victor R. Matricardi—The Aerospace Corporation

Tuesday, August 10, 2004 Technical Session III

Panel Discussion—Complementary or Disruptive Technology— The Debate About the Utility of Small Satellites

Moderator: Todd Mosher, Conference Program Chair

11:15 AM Panelists will be challenged to offer and defend their opinions on the value of small satellites. Conference attendees are encouraged to submit topical questions at the registration booth.

Panelists

Perry Ballard—Chief Engineer of the DOD Payloads Office, Johnson Space Center

Elon Musk—CEO and Chief Technology Office, Space Exploration Technologies

John Roth—President, MicroSat Systems, Inc.

Pete Rustan—Director of Advance Systems and Technology, National Reconnaissance Office (NRO)

Tuesday, August 10, 2004 Technical Session IV

Advanced Technologies Section I—Individual Subsystems or Components that Measurably Raise the Utility of Small Satellites

Chair: Jeff Janicik, Innoflight

- 2:00 PM** Application of Emerging Structural Energy Storage Technology to Small Satellite Systems
Philip Lyman, John Olson, Timothy Feaver—Boundless Corp.
- 2:15 PM** An Integrated Vision-Based System for Spacecraft Attitude and Topology Determination for Formation Flight Missions
Aaron Rogers, Kalle Anderson, Ray Zenick—AeroAstro, Inc.
- 2:30 PM** Rapid De-orbit of LEO Space Vehicles Using Towed Rigidizeable Inflatable Structure (TRIS) Technology Concept and Feasibility Assessment
Dave Beckett, Bryce Carpenter—Ball Aerospace and Technologies Corporation; Costas Cassapakis—L'Garde Inc.
- 2:45 PM** Applications of Multi-Functional Structures to Small Spacecraft
Jeff Preble, Mike Schoenoff, John DiPalma, Stephen Motoyama—SpaceWorks Inc.; James Guerrero, Capt. Russell Burks—Air Force Research Laboratory
- 3:00 PM** The Use of Overloaded Software Operators for Error Detection and Correction
Scott A. McDermott, Kalle Anderson, Luis G. Jordan—AeroAstro, Inc.
- 3:15 PM** Time-Optimal Magnetic Attitude Control for Small Spacecraft
Rees Fullmer, Jinsong Liang, YangQuan Chen—Utah State University

Tuesday, August 10, 2004 Technical Session V

Advanced Technologies Section II—Individual Subsystems or Components that Measurably Raise the Utility of Small Satellites

Chair: Darrin Buck, Swales Aerospace

- 4:15 PM Announcements
- 4:30 PM Advanced Wireless Communications Technologies for Low Power, Reconfigurable Small Satellite Radios
Michael Tompkins, Mathew Warner, Todd Mosher—Utah State University
- 4:45 PM Arc-Minute Nanosatellite Attitude Control: Enabling Technology for the BRITE Stellar Photometry Mission
Kieran A. Carroll—Dynacon Inc.; Slavek Rucinski—University of Toronto; Robert E. Zee—Space Flight Laboratory, University of Toronto
- 5:00 PM The Use of Small Cell Lithium-Ion Batteries for Small Satellite Applications
Chris Pearson, Nick Russel, Carl Thwaite, Rob Spurrett—AEA Technology
- 5:15 PM The Modular S-Band Radio Suite
Zeno Wahl, James Ramsey—AeroAstro, Inc.
- 5:30 PM Miniature Space GPS Receiver by Means of Car Navigation Technology
Yusuke Hamada, Nobuyuki Tomita—Musashi Institute of Technology; Takahide Mizuno, Kenji Shinkai, Kosuke Kawahara, Hirobumi Saito—Institute of Space and Astronautical Science, Japan Aerospace Exploration Agency; Hiroyuki Sasaki—Soka University
- 5:45 PM A Novel Approach to Designing and Building a High-Speed, Large Memory Data Storage Unit
Louis Piche, Blair Gordon—Routes AstroEngineering; Kjell Magnussen, Len Laba—McDonald Detwiller and Associates
- Alternate Minimizing Mission Risks through Emulating Space Communications Architectures
Thong Luu, Diepchi Tran, Frances Lawas-Grodek, Richard Slywczak, Allen Holtz, Brenda Ellis—NASA/Glenn Research Center

Wednesday, August 11, 2004 Technical Session VI

The Future—Science Missions Under Development or Proposed that Provide Measurable Utility to the Science Community

Chair: Andy Lewin, Johns Hopkins University/Applied Physics Laboratory

- 8:30 AM** **Announcements**
- 8:45 AM** **Living with a Star (LWS) Space Environment Testbeds (SET)**
Robert Patschke, Ken Label, Janet Barth, Carolyn Mariano, Karen Pham—NASA Goddard Space Flight Center; Carl Wu, David Kobe—The Hammers Company; Don Jarosz, Nick Teti—Swales Aerospace; Mike Cuvillo—QSS Group; Scott Appelbaum, Katie Barthelme—Omitron Inc.
- 9:00 AM** **Cibola Flight Experiment**
Diane Roussel-Dupré—Los Alamos National Laboratory; John Buckley, Phil Davies—Surrey Satellite Technology Ltd
- 9:15 AM** **Design of a Solar Kite Mission to Study the Earth's Magnetotail**
Vaios Lappas—University of Surrey; Luis Gomes—Surrey Satellite Technology Ltd.; Kotska Wallace—European Space Agency; Bong Wie—Arizona State University; Colin McInnes—University of Glasgow; Lorenzo Tarabini—GVM
- 9:30 AM** **EARTHSHINE—A Deep Space Science Mission using Small Satellite Technology**
Nigel Morris, Mike Lockwood—Rutherford Appleton Laboratory; Mark Smith, Roger Sides—EADS Astrium
- 9:45 AM** **Cassiope: A Canadian Smallsat-Based Space Science and Advanced Satcom Demonstration Mission**
Greg Giffin, Vicki Ressler—MacDonald Dettwiler; Andrew W. Yau, E. Peter King—University of Calgary
- 10:00 AM** **Space Technology 5: Enabling Technologies for Small Satellites**
Evan Webb, Candace Carlisle—NASA Goddard Space Flight Center
- Alternate** **D-SAT Simplified Magnetic Attitude Control**
Warren K. Soh, Norhizam Hamzah, Ahmad Sabirin Arshad—Astronautic Technology (M) Sdn Bhd

Wednesday, August 11, 2004 Technical Session VII

12th Annual Frank J. Redd Student Competition

Co-Chair: Doug Freesland, The ACS Engineering Corporation

Co-Chair: Gwynne Shotwell, Space Exploration Technologies

- 10:45 AM** Introduction to Student Scholarship Competition
Gwynne Shotwell, Scholarship Co-Chair
Doug Freesland, Technical Co-Chair
- 11:00 AM** Preliminary design of a Very-Low-Thrust
Geostationary Transfer Orbit to Sun-Synchronous
Orbit Small Satellite Transfer
Chris Rampersad—University of Toronto Institute for Aerospace Studies
- 11:15 AM** TREMOR: A Triple Modular Redundant Flight
Computer and Fault-Tolerance Testbed for the WPI
Pansat Nanosatellite
Ryan Angilly—Worcester Polytechnic Institute
- 11:30 AM** An Electrically Actuated Pin-Puller for Space
Application using Nickel-Titanium Memory Alloy
Peter M. Cipollo, Brendan S. Surrusco—The Pennsylvania State University
- 11:45 AM** Development of a Liquefied-Gas Micro-Satellite
Propulsion System
Robert B. Weyer—University of Stellenbosch
- 12:00 PM** Structure Design for Modular Platform and
Capability on the USUsat 2 Micro-Satellite
Joël Quincieu—Utah State University
- 12:15 PM** Platform for Attitude Control Experiment (PACE) an
Experimental Three-Axis Stabilized CubeSat
Jung-Kuo Tu, Shi-Hua Wu, Chen-Chi Chu—National Cheng Kung University

Wednesday, August 11, 2004 Technical Session VIII

University Programs—University Led Small Satellite Programs
Under Development that Lend Utility to Future Science Missions

Chair: Dave Klumpar, Montana State University

- 2:00 PM** **Low-Cost Ground Station Antenna Arrays for Microspacecraft Mission Support**
G. James Wells, Robert Zee, Mark Sdao—University of Toronto Institute for Aerospace Studies
- 2:15 PM** **An Approach to Automated Health Monitoring and Control Systems for Space Systems**
Roger W. Johnson, Dan Hand, Sanjay Jayaram, Jami Ward—University of Central Florida
- 2:30 PM** **Science Mission Scenarios Using “PALMSAT” Pico-Satellite Technologies**
Craig Underwood, Vaios Lappas—Surrey Space Centre; Martin Sweetin, Alex da Silva Curiel, Martin Unwin, Adam Baker—Surrey Satellite Technology Ltd.
- 2:45 PM** **Deployment Optimization of a Boom for FalconSAT-3 Using Elastic Memory Composite Material**
Pamala Fetchko, Jerry J. Sellers—US Air Force Academy; Mark Lake, Rory Barrett, Phillip Keller—Composite Technology Development; Gregg Spanjers, Mark Scherbarth, James Winter—Air Force Research Laboratory, Kirtland Air Force Base
- 3:00 PM** **Neural Network Based Orbit Propagation for Small Satellite Missions**
Liu Fang—Singapore Telecommunications; Narayanaswamy Nagarajan—Nanyang Tech University
- 3:15 PM** **A Highly Modular Scientific Nanosatellite: TEST**
David Voss, Josh Zapf, Hank Voss, Austin Kirchoff, Dwayne Hagerman, Darryl Tan—Taylor University; M. Maple, Farzad Kamalabadi—University of Illinois
- Alternates** **The IRIS Project: Student Designed Imaging Satellite for the RASCAL Launch Vehicle**
Quinn Young—Space Dynamics Laboratory; Todd Mosher, Jared Clements, Pranay Gupta, Matt Warner—Utah State University

Wednesday, August 11, 2004 Technical Session IX

The Year in Retrospect—Mission Summaries that Contrast the Performance of Small Satellites Launched over the Past Year with Conventional Spacecraft in Similar Mission Areas

Chair: Richard Holdaway, Rutherford Appleton Laboratory

- 4:30 PM** **The MOST Satellite Mission: One Year in Orbit**
 Simon Grocott—Dynacon, Inc.; Robert E. Zee—Space Flight Laboratory, University of Toronto Institute for Aerospace Studies; Jaymie Matthews—University of British Columbia
- 4:45 PM** **Commissioning of a Small Satellite Constellation—Methods and Lessons Learned**
 Dave Gibbon, Yoshi Hashida, Lee Boland, Neville Bean, Alex da Silva Curiel, Martin Sweeting—Surrey Satellite Technology Ltd.; Phil Palmer—University of Surrey
- 5:00 PM** **BILSAT-1: First Year in Orbit—Operations and Lessons Learned**
 Gokhan Yuksel, Hakan Urhan, Onder Belce—TUBITAK-BILTEN; Neville Bean, Alex da Silva Curiel, Luis Gomes, Andy Bradford—Surrey Satellite Technology Ltd.
- 5:15 PM** **Using Nanosats (e.g. QuakeSat) as a Proof of Concept for Space Science Missions**
 Scott Flagg, Tom Bleier, Clarke Dunson, John Doering, Louis DeMartini, Paul Clarke, Lew Franklin, Jeannie Seelbach, Janine Flagg, Mary Klenk, Victor Safradin—QuakeFinder; Jamie Cutler—Stanford University; Allen Lorenz, Eric Tapio—Lockheed Martin
- 5:30 PM** **MICRO LABSAT—Technology Demonstration Microsatellite for Future Missions**
 Toru Yamamoto, Hidekazu Hashimoto, Shinichiro Nishida—Japan Aerospace Exploration Agency; Shinichi Nakasuka—University of Tokyo; Shinichi Kimura—Communications Research Laboratory
- 5:45 PM** **Cal Poly Coordination of Multiple CubeSats on the DNEPR Launch Vehicle**
 Simon Lee, Armen Toorian, Nash Clemens, Jordi Puig-Suari—Cal Poly CubeSat; Bob Twigg—Stanford University
- Alternate** **A PDA-Controlled Pico-Satellite, Cute-1.7, and its Radiation Protection**
 Masafumi Iai, Yusuke Funaki, Munetaka Kashiwa, Kyoichi Ui, Naoki Miyashita, Wataru Miyazawa, Kuniyuki Omagari, Masashi Asami, Kazuya Konoue, Koji Nakaya, Saburo Matunaga—Tokyo Institute of Technology

Thursday, August 12, 2004 Technical Session X

Launch Update—Opportunities and Launch Methods that Provide Utility to the Small Satellite Community

Chair: James McLeroy, The Aerospace Corporation

- 8:30 AM Announcements
- 8:45 AM Reducing the Cost of Launching Small Satellites: A Perspective From the Field
Theresa Kuennen, Capt. Horst D. E. Knorreck, Lt Mitchell W. Elson—Det 12/RP Kirtland AFB, NM; Steven J. Buckley—Northrop Grumman RSLP
- 9:00 AM DARPA's RASCAL: Status, Challenges and Accomplishments
Jacob Lopata—The Space Launch Corporation; Preston Carter—Tactical Technology Office DARPA
- 9:15 AM Development of a Dedicated Launch System for Nanosat-Class Payloads
John M. Garvey—Garvey Spacecraft Corporation; Eric Besnard—California State University, Long Beach
- 9:30 AM Low Cost Spacelift to LEO, GEO, and Beyond Using the OSP-2 Peacekeeper Space Launch Vehicle
Scott Schoneman, Lou Amorosi, Ron Willey, Dan Cheke—Orbital Sciences Corp.
- 9:45 AM The Geo Quick Ride (GQR) Program—Providing Inexpensive and Frequent Access to Space
Robert Caffrey, John Baniszewski—NASA Goddard Space Flight Center
- 10:00 AM FALCON I Program: Status, Capabilities, and Manifest
Hans Koenigsmann, Gwynne Shotwell, Elon Musk, Anne Chinnery—Space Exploration Technologies
- Alternate Space Exploration Via Technology Demonstration and Small Satellite Missions Flown on Reusable Launch Vehicles
Debra Faktor Lepore—Kistler Aerospace Corporation

Thursday, August 12, 2004 Technical Session XI

Propulsion—Key Technologies for Efficient Propulsion to Place Small Satellites in their Target Orbits

Chair: Greg Spanjers, Air Force Research Laboratory

- 10:45 AM** Farewell Announcements
- 11:00 AM** Small Satellite Mars Missions Using Electric Propulsion
Michael Price, N. S. Wells—QinetiQ; J. C. Zarnecki, A. J. Ball—PSSRI, Open University; F. W. Taylor—University of Oxford
- 11:15 AM** Advancing the Utility of Small Satellites with the Development of a Hybrid Electric-Laser Propulsion (HELP) System
Rachel Leach, Gerald B. Murphy, Thomas S. Adams—Design_Net Engineering
- 11:30 AM** An Experimental Colloid Thruster Package for Nano Satellites
Barry J Kent, Bob Stevens—Rutherford Appleton Laboratory; Adam Baker, Douglas Liddle, Dave Gibbon—Surrey Satellite Technology Ltd.; John Stark, Matt Alexander—Queen Mary, University of London
- 11:45 AM** Design and Integration of a Lightweight Pulsed Plasma Thruster for Solar Sail Attitude Control Applications
Kevin Pryor, Pavlos Mikellides, Bong Wie—Arizona State University
- 12:00 PM** Development of Micro Colloid Thrusters: Investigation of Electrospray using Very Small Capillaries
David J Webb, Stephen B. Gabriel—School of Engineering Sciences, University of Southampton
- 12:15 PM** Advancing the Utility of Small Satellites with the Development of a Hybrid Electric-Laser Propulsion (HELP) System
Rachel Leach, Gerald B. Murphy, Thomas S. Adams—Design_Net Engineering